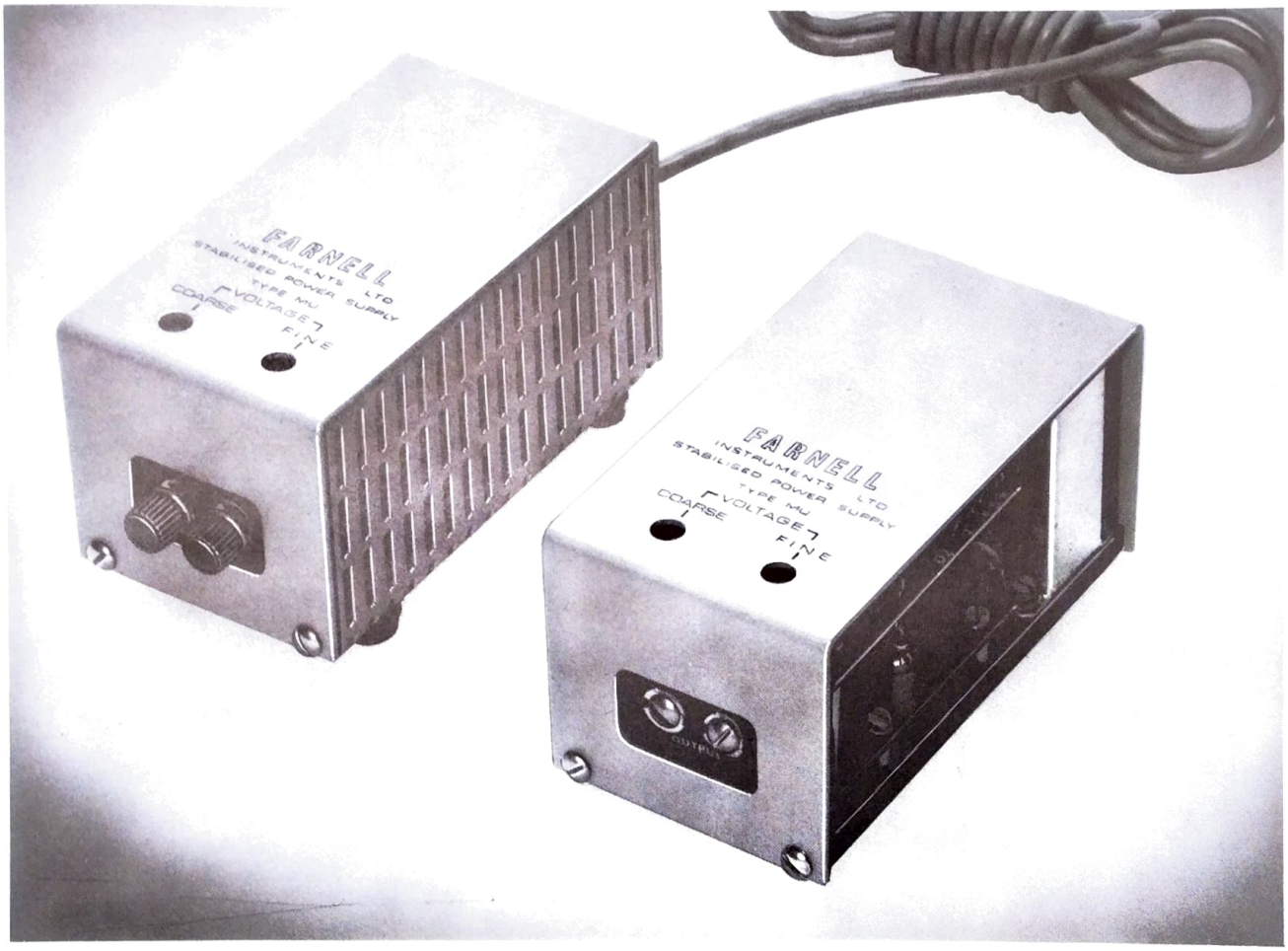
Publication PS11

Farnell

MU power supply



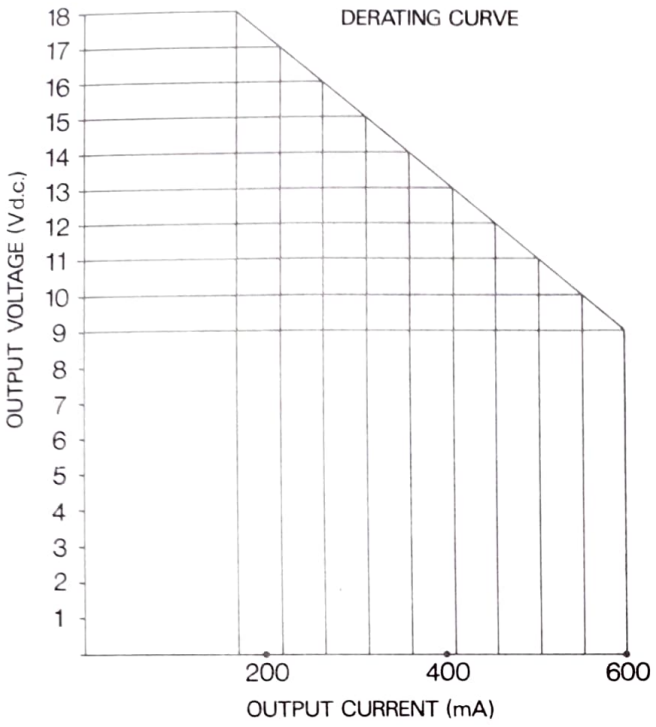
A low cost compact unit ideal for incorporating into original equipment

The MU power supply has a stabilised d.c. output, floating with respect to earth, which is continuously variable between 1—18V. Output adjustment is by coarse and fine potentiometers and from 1—9V the full output current of 600mA is available. From 9—18V the current derates linearly to 175mA.

Overload and short circuit protection is afforded by current limiting circuitry which automatically resets on removal of the fault condition.

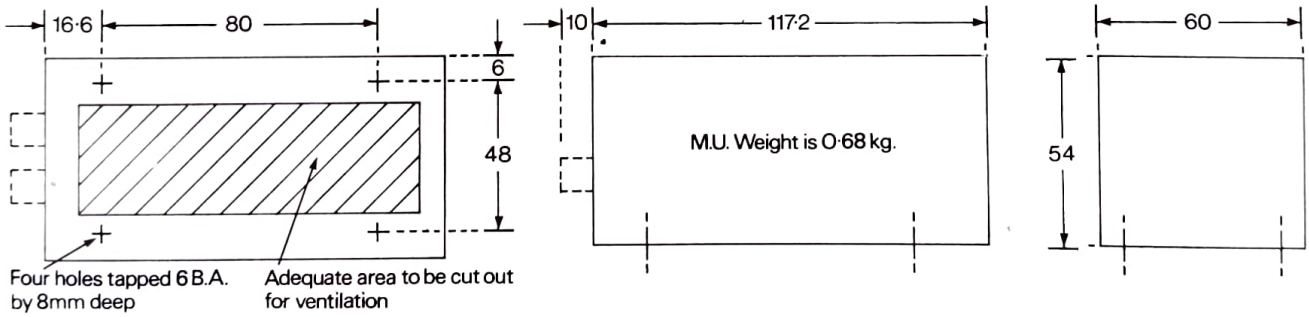
Because the MU does not have to be preset on test to a user specified voltage it may be despatched from stock without delay, **subject to availability.**

Specification



MAINS INPUT	A.C. mains 220, 240V 50–400Hz (110–115V to special order)
MAINS VARIATION TOLERATED	±10%
OUTPUT	1–18V d.c. 600–175mA (see derating curve)
LINE REGULATION Output change for a ±10% mains change	Less than 1mV
LOAD REGULATION Output change for a zero to full load change	Less than 5mV
RIPPLE AND NOISE at full load (Δf = 80kHz)	Less than 1mV pk-pk
TRANSIENT RECOVERY TIME typical	Less than 300μS for output to recover within 50mV following a full load change of 1μS rise time
OUTPUT IMPEDANCE typical	Less than 0.1Ω at 1kHz and 25°C
TEMPERATURE COEFFICIENT typical	0.02% per °C
OPERATING AMBIENT TEMPERATURE RANGE	−10°C to +60°C
STORAGE TEMPERATURE RANGE	−40°C to +85°C
OPTIONAL EXTRAS	Metal mesh cover, insulated terminals and mains lead

Dimensions and fixing (mm)



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Manufactured in England by:

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We reserve the right to amend specifications without notification.

FARNELL INSTRUMENTS LIMITED

STABILISED POWER SUPPLY UNIT
TYPE MU

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SECTION I

INTRODUCTION

The stabilised power supply unit type MU provides a stabilised voltage variable from 1–18 volts. The maximum output current that can be drawn increases linearly from 175mA at 18V. to 600mA. at 9V. and below.

Overload protection is provided by current limiting circuitry which keeps the output approximately constant on overload. The unit automatically resets on removal of the overload.

The unit will operate from 220 or 240 volts, 50/400 Hz. (alternative units are available for operation from 110 or 115 volts, 50/400 Hz).

The unit is small and compact and of sub-unit form suitable for incorporation into other equipment. Units can be mounted in any plane provided free air flow is allowed.

SECTION II

OPERATING INSTRUCTIONS

Connection to the mains is via the terminal block on base of unit. Due to recent changes in colour coding standards, for mains cables the coding may be either of the following :—

(*a*)	RED	Live.
	BLACK	Neutral.
	GREEN	Earth.
(*b*)	BROWN	Live.
	BLUE	Neutral.
	YELLOW and GREEN	Earth.

Input voltage adjustment is by simple tap change on the tag board on the underside of the unit.

D.C. output is taken from the terminals at the end of the unit.

Output voltage adjustment is by means of "Coarse" and "Fine" controls situated on the circuit board. Access to them is via holes in the top of the cover. Although it is possible to set these controls to give more than 18 volts, the unit should not be used in this condition.

SERIES OPERATION

Units may be connected in series to provide higher voltage output, but diodes capable of carrying the full load current must be connected across each output in such a manner as to reverse bias them under normal operating conditions (i.e. cathode to positive output terminal).

PARALLEL OPERATION

Units set to approximately the same output voltage may be connected directly in parallel. On increasing load the unit having the highest output voltage will carry the load, until it current limits, thereafter the unit having the next highest voltage will supply the extra current, until it limits, and so on. A typical output characteristic is shown in fig. 2. The characteristic shows a series of descending steps in output voltage at the current limit points of individual units, the amplitude of the step depends on how closely the output voltages have been set, and it may not be possible to adjust this to better than 50mV.

It is recommended that no more than three units are parallelled in this way.

SECTION III

CIRCUIT DESCRIPTION

The circuit employs a series regulator transistor driven via an emitter follower from a differential amplifier, which compares the voltage of a zener diode reference with a proportion of the output voltage derived from a resistive potential divider.

The mains supply is connected to transformer MT1 via fuse F1. The main secondary winding supplies a bridge rectifier, reservoir capacitor system, which provides the main unregulated D.C. line. The positive line is connected via the series regulator transistor to the positive output terminal. The negative line is connected to the negative output terminal.

Supplies for the amplifier and reference system are derived from the auxiliary 28 volt secondary winding via rectifier diodes D5 and D6, and smoothed by capacitor C1. The unstabilised reference line across C1 is fed to the zener diode stabilising network R1, Z1, R2, Z2, which provides a +10–0– –5V supply for the differential amplifier. R3 supplies current to the main reference zener diode Z3, and potential divider chain R4, P1 and P2.

The base of VT2 and negative of Z3 are connected to the positive output terminal. Z3 therefore gives a voltage positive with respect to the positive output line. R4 is connected between the positive Z3 and VT1 base. Signal voltage between VT1 and VT2 bases is amplified at the collectors of VT2 and VT3, VT3 being a high impedance collector load, whose dynamic impedance is varied by VT1. The signal is then applied via R7 and the emitter follower VT5, to the series regulator VT6 in such a sense as to oppose the original signal at VT1 and VT2 bases. The action of the loop is therefore to maintain zero signal between VT1 and VT2 bases. Output voltage is determined by :—

$$\frac{\text{Vref. (P1 + P2)}}{\text{R4}}$$

SECTION IV

SPECIFICATION

Mains Input :
0–220–240V. at 50/400 Hz. (alternative unit : 0–110–115V. at 50/400 Hz).

Output Voltage :
1–18V. adjustable over the range by coarse and fine controls.

Output Current :
600–175mA. dependent upon the output voltage as shown in fig. 1.

Output Change for Zero to Full Load Change
Less than 5mV.

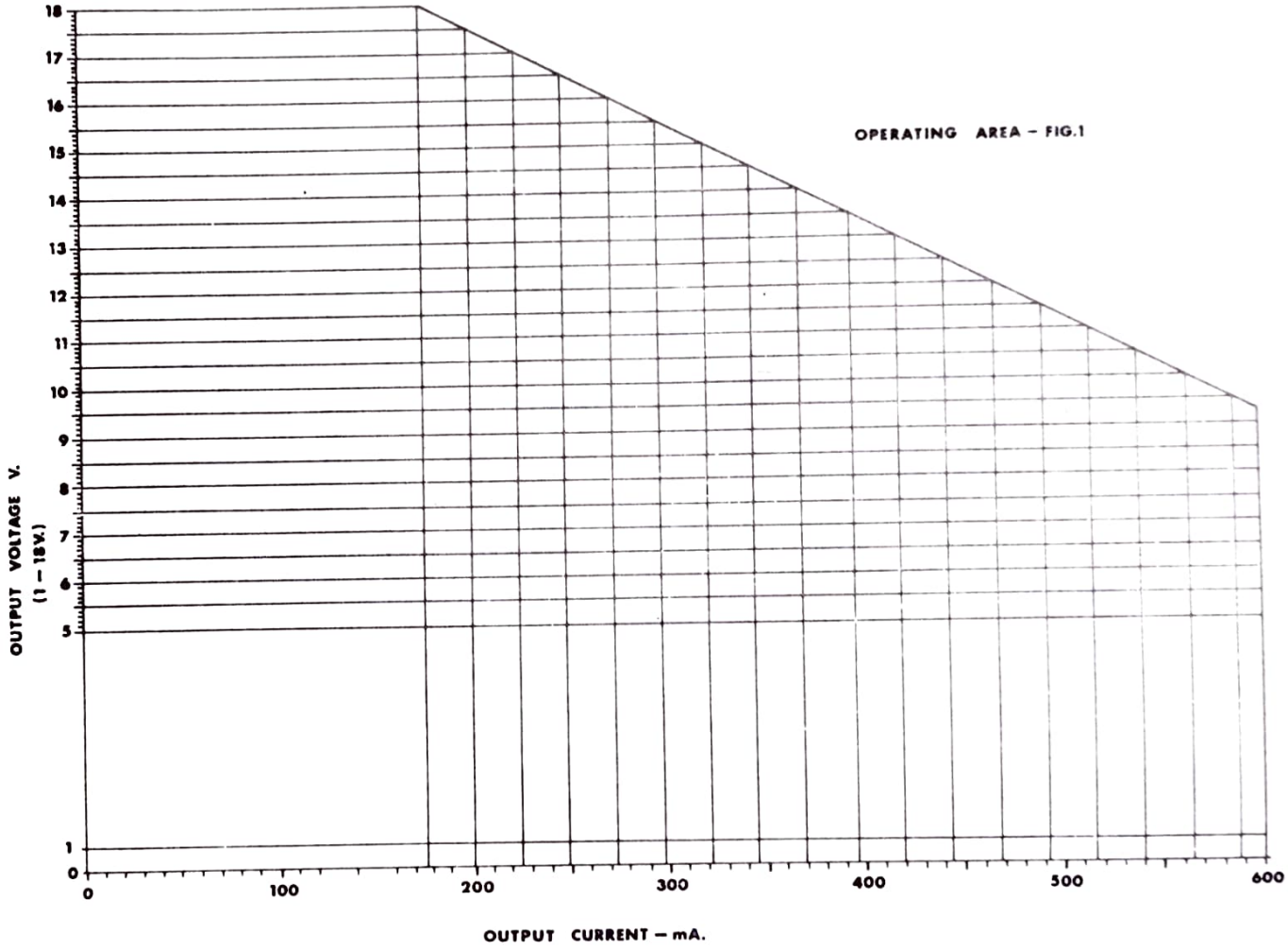
Output Change for ±10% *Mains Change :*
Less than 1mV.

Ripple Voltage at Full Load
Less than 1mV. peak to peak.

Overload Protection :
Current limiting.

Mains variation Tolerated :
± 10% of nominal.

Maximum Operating Temperature :
60°C.


OPERATING AREA – FIG.1
OUTPUT VOLTAGE V.
(1 – 18V.)
18
17
16
15
14
13
12
11
10
9
8
7
6
5
1
0
0
100
200
300
400
500
600
OUTPUT CURRENT – mA.

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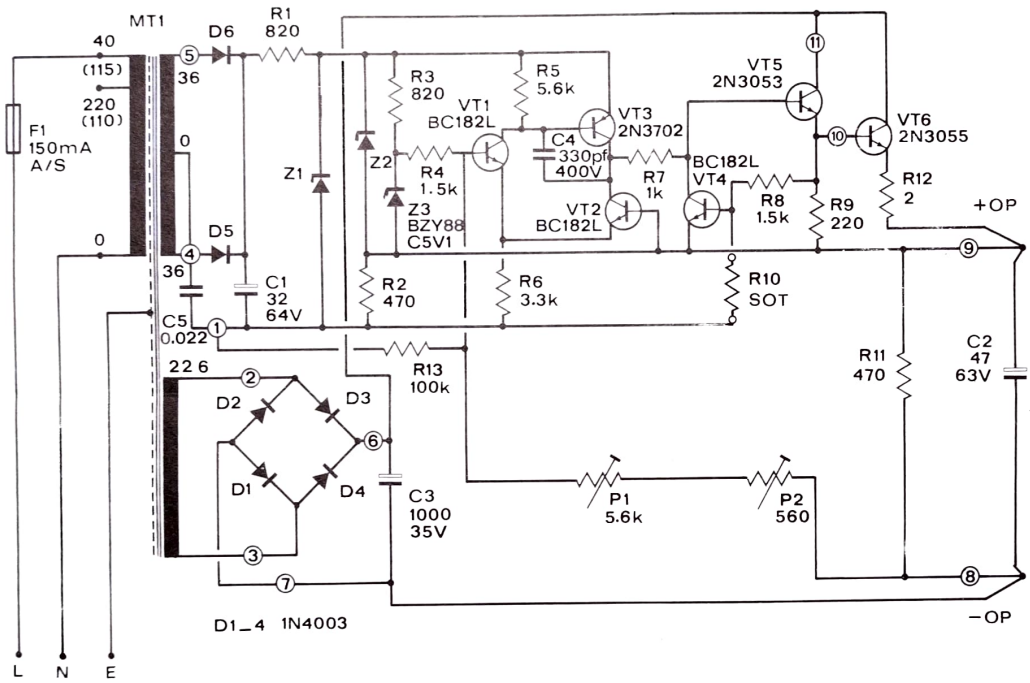
R		1	2	3	4	6	5	7	10	8	9	11	12
C	5	1		3		4						2	
VT						1		3	2	4	5	6	
MISC	F1	MT1	D6	5	D1_4	Z1	Z2	Z3	P1		P2		

D5_6 1N4003

Z1_ MZ15T5
Z2_ MZ10T5



CIRCUIT COMPONENTS

REF.	QTY.	MANUFACTURER	TYPE NO.	RATING	TOL.
R1	1	ELECTROSIL	TR6	1 WATT	5%
R2 to R9	1 each	ERIE	EMI	1/8 Watt	..
R10	1	WELWYN	MR5	1/2 Watt	..
R11	1	ELECTROSIL	TR6	1 Watt	..
R12	1	ERG	W21		..
R13	1	MULLARD	MR25		
C1	1	MULLARD	C426 AR H32		
C2	1	..	C426 AR G58		
C3	1	WIMA	PRINTLYTE		
C4	1	ERIE	K170051 831	400V	
VT1	1	TEXAS	BC 182 L		
VT2	1	..	..		
VT3	1	..	2N3702		
VT4	1	..	BC 182 L		
VT5	1	RCA	2N3053		
VT6	1	..	2N3055		
D1 to D6	1 each		1N4003		
Z1	1	I R	MZ15T5		
Z2	1	..	MZ10T5		
Z3	1	EMI HUS	BZY88 C5V1		
MT1	1	CUMBERNAULD			
F1	1	BESWICK	TDC 134		
P1	1	PLESSEY(5.6k)	WMP		
P2	1	.. (560)	..		

TRACED	Sue A	5	15 6 70	768	11	18 11 70	4050	12	17 9 79	5939
CHECKED	K	4	2 12 69	684	10	22 9 75	3527			
		3	10 11 69	663	9	12 12 74	3278			
		2	20 8 69	623	8	29 3 73	2219			
DRAWN	R.E.T.	ISS	DATE	MOD NO.	7	29 11 72	1858			
		1	19 4 69		6	27 9 71	1076			

NOTE
CAPACITOR VALUES IN μF
RESISTOR .. .. .. Ω
① REEERS TO CCT BD PIN CONNECTION NOS.

FARNELL INSTRUMENTS LTD. WETHERBY. W. YORKS.

CIRCUIT DIAGRAM

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